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## THE CURL SNAKE *Denisonia suta* (Peters) A DANGEROUS ELAPID IN THE NORTHERN TERRITORY

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### Summary

The Curl snake *Denisonia suta* (Fig. 1) has previously been disregarded as a species potentially dangerous to man. A venom toxicity study undertaken on Northern Territory specimens reveals a subcutaneous LD<sub>50</sub> of 20.68  $\mu$ .g. in 20 gram mice. Variation is evident in the total lengths of adult snakes collected from three geographically isolated populations and this feature is correlated with venom yields of adult specimens representing two of these populations (Fig. 3). Some aspects of *D. suta* natural history in the Northern Territory are considered in the assessment of its threat to man in this state.

### Introduction

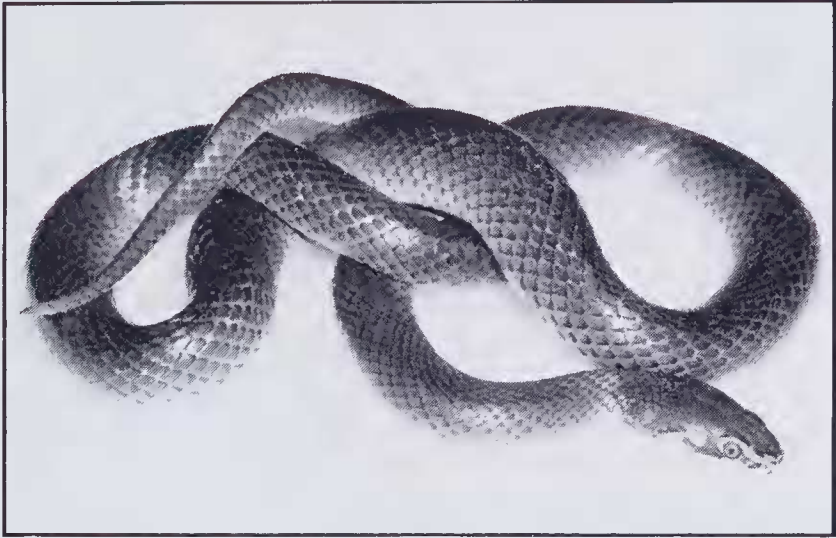
Throughout its distribution *Denisonia suta* is entirely nocturnal in habit and shelters during the day beneath rocks and debris or in deep ground crevices.

Probably because of its small size, *D. suta* has not been regarded as dangerous to man. Most authors agree that it is capable of inflicting an extremely painful bite or that care should be taken with large specimens (Kinghorn, 1964, P. 176; Kellaway, 1934; Worrell, 1966, P. 146; Cogger, 1979, P. 404; Gow, 1976, P. 65; McPhee, 1979, P. 70) however it has also been inferred to be an innocuous species (Houston, 1973).

In November 1979 a domestic cat sustained a fatal bite while eating a juvenile *D. suta* in a residential area of Alice Springs. Details of this case are presented below. Following this incident a study was initiated to assess the potential of *D. suta* as a snake dangerous to humans.

In this assessment we have examined snake length, venom yield and venom toxicity combined with relevant information on the distribution, behaviour and ecology of the species.

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*Fig 1: Typical adult from Alice Springs district.*

## Methods

To determine venom yields, captive specimens were deprived of food for a week prior to venom extraction. During early trials it was discovered that captive snakes readily expelled venom for about the first 20 seconds they were handled but any prolonged attempt to individually 'milk' both glands usually resulted in a poor yield from the second fang. To overcome this bias a pipette was used to milk venom from the right side fang only and this venom weight was then doubled to provide the total yield.

The LD<sub>50</sub> determination was calculated using the Spearman-Kärber method (Finney,<sup>50</sup>1964) with venom obtained from snakes collected from the Barkly Tableland and Alice Springs districts. Fresh and freeze-dried, reconstituted venom was used.

Eighteen to twenty one gram laboratory white mice were injected subcutaneously in the flank with a 0.2 ml saline solution of a range of dilutions of fresh venom. The range of doses given was from 8  $\mu$ .g. to 30 $\mu$ .g. in a dose interval of 1:1 $\frac{1}{4}$ . Deaths were recorded over a 48 hour period.

## Results

**Distribution and Habitat:** In the Northern Territory this species is represented by three geographically isolated populations (Fig. 2). Throughout the central Alice Springs district it inhabits rocky ranges and adjacent riverine and woodland areas. In the Barkly Tableland district, it occurs throughout the 'black soil' tussock grass plains. The two Victoria River district specimens were collected from an alluvial flood plain with grass tussocks and cracking soil.

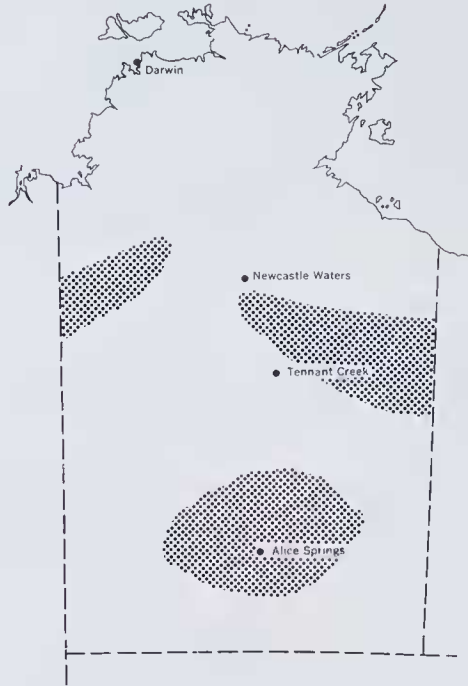


Fig. 2: Distribution of *Denisonia suta* in the Northern Territory.

**Geographic Variation in Snake Lengths:** Twelve specimens collected from the Alice Springs district ranged from 31-56 cm in total lengths with a mean of 43.5 (s.d. = 8.3). Twelve specimens collected from the Barkly Tableland district ranged from 57-75 cm in total lengths with a mean of 70.3 (s.d. = 5.4). Only two specimens, measuring 52 and 54 cm in total lengths, have been collected from the Victoria River district. The tails of all snakes measured, were complete.

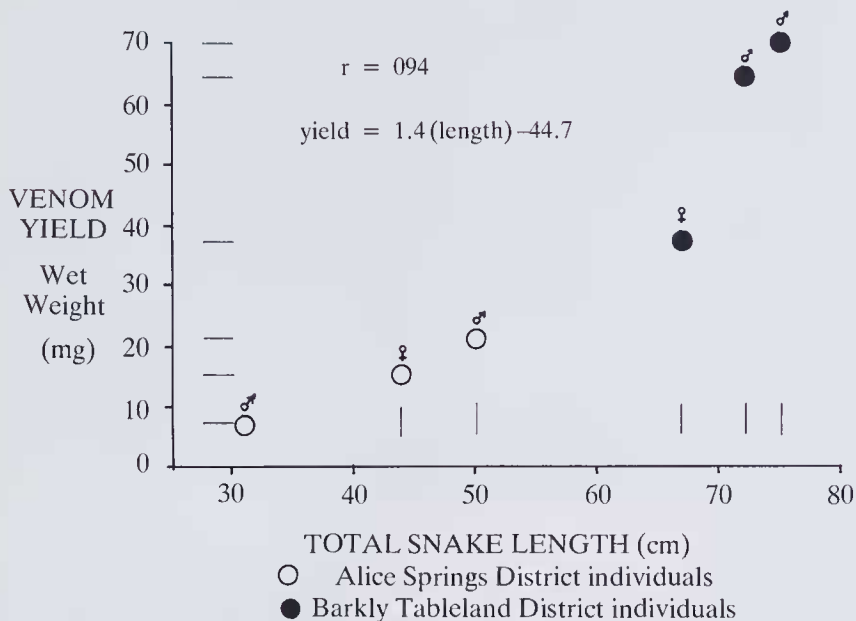


Fig. 3: Relationship between snake length and venom yield.

**Venom Yields:** Figure 3 correlates venom yields with the total lengths of six snakes collected from the Alice Springs and Barkly Tableland districts.

**Venom Toxicity:** Dose and survival rates are presented in Table 1.

Table 1:

Dose ( $\mu\text{g}$ )	8	10	12.5	15.6	19.6	24.5	30.6
Survival Rates	4/4	4/4	4/4	4/4	3/4	0/4	0/4

The  $LD_{50}$  was calculated at  $20.68 \mu\text{g}$ . with the limits of confidence at  $18.29 \mu\text{g}$  to  $23.38 \mu\text{g}$ .

There was no significant difference in results obtained from fresh venom and freeze-dried, reconstituted venom, or in the venom toxicities of snakes from the Barkly Tableland and Alice Springs districts.

**Envenomation:** A 4 kg cat was bitten on the upper lip by a snake measuring approximately 25 cm in total length. One hour after the bite the cat appeared distressed and slight hind limb paralysis was evident. The following conditions were recorded: vomiting; progressive respiratory paralysis; loss of eye preservation reflex; dilation of the pupils; uncontrolled urination; inability to stand; coma; death following terminal fits at approximately 4 hours after the bite.

Two adult rabbits were injected subcutaneously with venom doses of  $1\frac{1}{2}$  and 2 times the calculated LD<sub>50</sub>. Both rabbits appeared normal for an initial 35 minutes. The first sign of envenomation was dilation of the pupils which was rapidly followed by acute respiratory distress. Death occurred 45 minutes after the injection of venom.

Bite and injection sites were surrounded by local swelling and on sectioning clear oedema fluid was revealed. There was no evidence of haemolysis at the injection site. The lungs were oedematous in both the cat and the rabbits. Both the cat and the rabbits showed generalised mild perivascular oedema, swelling of the endothelial cells of blood vessels, and extensive alveolar oedema.

### Discussion

Contrary to suggestions of hyperaggressiveness (Gow, loc. cit.), it is our experience in the Northern Territory that *Denisonia suta* will not attack unless provoked and will always attempt to escape even if it is closely pursued. However, it will bite savagely if it is handled and certainly if it is trodden underfoot it will nearly always bite while simultaneously struggling to free itself. The observations of McPhee, loc. cit. closely support our appraisal of *Denisonia suta* temperament.

When handled *D. suta* usually bites with the intention of delivering a prolonged 'chewing' bite rather than a momentary 'snap' bite. Several adult humans have suffered bites from this species while attempting to catch snakes in the Alice Springs town area. In all cases however the snake was quickly detached and it managed to deliver only a 'snap' bite. Reaction to the venom was mild, viz., local pain and substantial local swelling at the bite site which may radiate out to effect an entire limb.

In the Northern Territory the distribution of *Denisonia suta* generally coincides with areas of sparse human settlement (Fig. 2). One major town, Alice Springs (population of approximately 20,000), is encompassed by the distribution of this species but elsewhere human occupation is restricted to pastoral communities and Aboriginal settlements. In Alice Springs this species occurs throughout the residential town area and during summer many specimens are collected in and around houses at night.

In the southern Northern Territory its average adult length is much smaller than that of its counterpart 'Barkly' population. Using size and hence venom yield as the general criterion for assessing potential danger it is considered that in the 'Barkly' district snakes of average adult size and over are potentially dangerous to humans of all age groups while in the southern region snakes of maximum size constitute a danger to children. The maximum and average adult lengths of Victoria River district individuals are uncertain, however, those lengths given for the Barkly Tableland population are possibly also representative for snakes of this population.

Clinical and pathological evidence is consistent with the venom containing at least neurotoxins and cytolytins. There was no evidence of coagulants or haemolysins. These findings support the views of earlier workers:

Kellaway, loc. cit. records the reaction of a guinea pig, weighing 357 grams, after it was bitten by a *Denisonia suta* measuring 16½ inches in length.

"It... caused paralysis and death from failure of respiration in sixteen minutes... The venom evidently contains no thrombin... Its toxicity... depends upon its action on the motor nerve endings in the diaphragm."

"The venom is neurotoxic, without coagulants..." Worrell, loc. cit.

In conclusion we propose that although *Denisonia suta* is a proven threat to domestic small animal life, it poses only a minor hazard to humans in the Northern Territory.

### Addendum

After this paper went to press, Dr. G. M. Storr of the Western Australian Museum, referred the Victoria River district specimens to a new taxon. *Denisonia* nov. sp. Populations in the Barkly Tableland and Alice Springs districts remain *D. suta* (Storr, pers. comm.).

### Acknowledgements

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